PATENT
0104-0354P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicants:	William HOLM et al.	Conf.:	7653
Serial No.:	09/901,592	Art Unit:	1762
Filed:	July 11, 2001	Examiner:	Parker, F. J.
For:	METHOD AND APPARATUS FOR APPLYING VISCOUS MEDIUM ONTO A SUBSTRATE		

DECLARATION UNDER 37 C.F.R. §1.132

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

I , Dr. William Holm, residing at Skalbaggestigen 14A, SE-125 51 Älvsjö, Sweden do declare and say as follows:

1. I am familiar with the subject matter of the above identified application (United States Serial No. 09/901,592) of which I am a contributing inventor.

2. In the Examiner's Office Action dated May 2, 2007, the Examiner rejects claims 1, 8, 19, 20, 31 and 39 under 35 U.S.C. § 102(e) as being anticipated by Takahashi et al., U.S. Patent No. 6,296,896. Furthermore, claims 1, 8, 19, 20, 31 and 37-41 have been rejected under 35 U.S.C. § 102(e) as being anticipated by Zandman et al., U.S. Patent No. 6,271,060. In addition, claim 34 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Takahashi et al. or Zandman et al. Further, claims 2-7 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Takahashi et al. or Zandman et al. in view of Itsuji, U.S. Patent No. 5,151,299. Finally, claim 42 stands rejected under 35 U.S.C. § 103(a) as being

unpatentable over Zandman et al. alone, or Takahashi in view of Zandman et al. I do not agree with the Examiner's rejections for the following reasons.

3. Our invention concerns the process known as surface mount technology (SMT). Basically this process consists of three steps; the application of solder paste to a printed wiring board, the mounting of components in said solder paste, and the reflow of said solder paste to form solder joints between the components and the board. The prevalent technique used for application of solder paste is screen (or stencil) printing. This technique has some inherent limitations, e.g. the aspect ratio of the stencil apertures is limited by the fact that the paste should adhere to the board when the stencil is removed. After the introduction of jetting as an alternative to screen printing, new solutions to these constraints are possible. The present invention utilizes jetting to complement screen printing to overcome the inherent deficiencies mentioned above. In this context, jetting is an enabling technology for this invention.

The Examiner relies on three references to reject the claims. No one of these references concerns SMT. Furthermore they do not, taken alone or together, lead one having ordinary skill in the art to the presently claimed invention.

Takahashi et al.

Takahashi et al describes a process where electrodes are formed on a substrate by screen printing and thereafter an electroconductive film is applied with the aid of jetting. The aim is to produce image display panels. This is not a field of technique normally associated with SMT, rather it is closer to semiconductor processing (see, e.g. column 2, lines 47-50 of Takahashi et al.). Takahashi et al. also differs from the presently claimed invention in that the electrodes are

finished before the application of the electroconductive film. In the presently claimed invention the words "prior to hardening of the screen printed viscous medium" make this clear. To one having ordinary skill in the art, it is obvious that the electrodes in Takahashi et al. are already in their final form before the jetting takes place. For instance, at column 3, lines 18-27, the problem of porosity is discussed. This is a well-known problem within the art. The electrodes are produced by screen printing a paste consisting of metal particles, glass frit, and an organic vehicle (column 10, lines 58-60 and [1]). This homogenous paste is then fired to produce the final electrodes. In this process, the organic matter is volatized or oxidized, leaving behind a composite made of a mixture of metal and glass. It is well known that the resulting film is not completely dense but contains pores [1, 2]. Several things can be done to reduce the porosity, e.g. the addition of flow control additives like ammonium sulphate [2]. In Takahashi et al., the problem is addressed in a different manner by letting an aqueous resin fill the pores (see column 35, lines 10-21).

Zandman et al.

Zandman et al. describes a process for manufacture of components, so called Chip Scale Packages (CSP). The outline of such a package is a silicon die with solder bumps thereon. The bumps will in a later assembly stage form part of the interconnection between the component and a printed circuit board (PCB, see column 2, lines 18-21). In Zandman et al., a patterned overcoat 210 is formed on the wafer leaving some parts exposed. One example of such an overcoat is a polyimide layer applied by screen printing (column 5, lines 19-29). To one having ordinary skill in the art, it is obvious that this polyimide must be cured and hardened, i.e. no longer in viscous

form, to perform the ensuing process steps. For example, in figure 3 a stack is formed where the overcoat layers are pressed against the back side of next chip in the stack. This would clearly not work if the polyimide was still in viscous form. In a later processing step, bumps are formed on parts not covered by the overcoat layer. There are several conventional ways to perform this step, one alternative being jetting (col. 7 lines 44-59). The operation of the jetting equipment mentioned comprises the steps of; singulating a solder ball from a reservoir, transporting the ball to an intended location; and reflowing the ball with a laser beam [3]. It is clear that Zandman et al. would not lead one having ordinary skill in the art to arrive at the claimed invention, in particular since the screen printed substance is no longer in viscous form when the jetting step is performed.

Itsuji

Itsuji concerns a method of forming resistors on a printed wiring board by printing of carbon instead of mounting chip components. It is well known within the art to use screen printing to accomplish this (column 1, lines 12-17). Itsuji has recognized a number of problems related to the screen printing step and proposes to instead apply a laminated film coated with a carbon resistance layer to the printed wiring board. The next step is to selectively cure (by thermosetting) the carbon resistance at the required locations. Finally, the uncured material is removed after the thermosetting (column 2, lines 47-57). Thus, Itsuji does not teach the removal of screen printed material. Furthermore the teachings of Itusji do not lead one having ordinary skill in the art to the idea of removing undesired solder paste, because the selective curing taught would not work for solder paste. Specifically, since the heat necessary to melt the solder can not

be applied selectively to parts of a solder paste deposit, the thermal conductivity of the paste and the substrate would necessarily melt all the solder of the deposit.

In view of the above, it is my opinion that the Examiner's rejections of the claims is improper and should be reconsidered and withdrawn.

[1] W. T. Hicks, in Handbook of Thick Film Hybrid Microelectronics, edited by C. A. Harper (McGraw-Hill, New York, 1974).

[2] L. F. Miller, Thick film technology and chip joining (Gordon and Breach, Science Publishers, New York, 1972).

[3] P. Kasulke, G. Azdasht, E. Zakel, and H. Reichl, Solder ball bumping (SBB). A flexible equipment for FC, CSP, BGA and printed circuit boards. International Flip Chip, Ball Grid Array, TAB and Advanced Packaging Symposium 1997. Proceedings.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

July 29, 2007
Date

By _____
Dr. William Holm